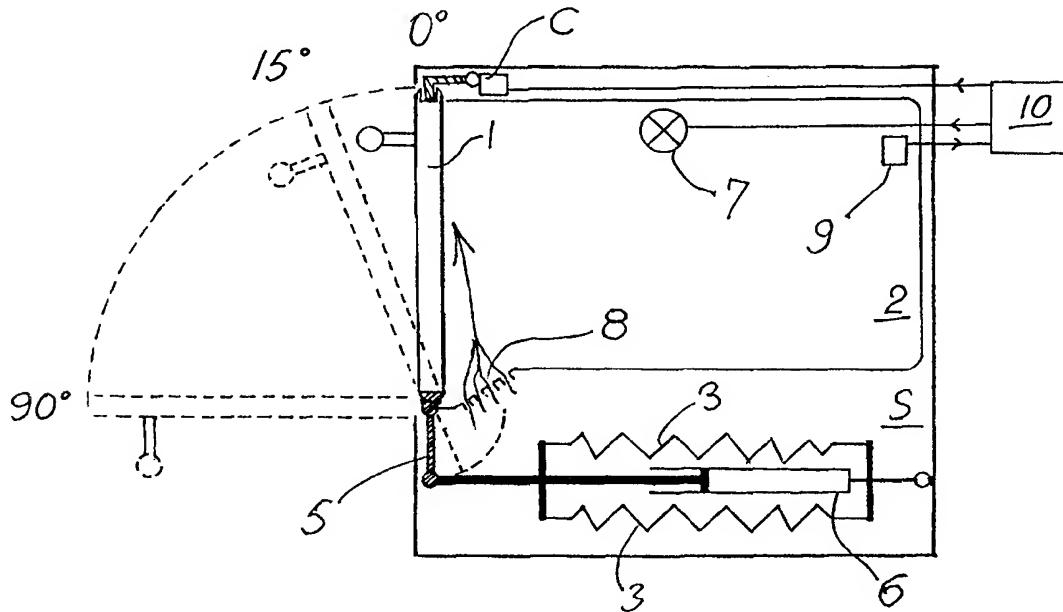




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(54) Title: A DEVICE FOR TERMINATING COOKING AND INDICATING STATUS



(57) Abstract

The end of cooking or baking in an oven may be determined by presets or by the measurement of suitable parameters. The end triggers an automatic opening of the door in order to advertise the status. The door opening may be combined with a sudden change in the strength of the cavity light when the operation is automatic, whereas manual closing and opening causes the light to fade out or in. A partial opening to signal end of cooking and venting is accompanied by flashes of light.

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A device for terminating cooking and indicating status.

5 The invention relates to a device for terminating cooking and indicating the status in an oven for the preparation of food comprising an oven cavity and an oven door.

Ovens which are set by a timer to a finishing time are well known and they exist in simple user-set versions or in more elaborate versions where the finishing time is 10 calculated internally in the oven control circuitry, e.g. by measured parameters.

Simple ovens may be set to switch-off the power supply at the finishing time, and more elaborate ovens may calculate the remaining heat in the oven and perform the switching-off before the actual finishing time. The parameters measures may be 15 temperature, humidity or composition of fumes developed within the cavity, and advanced data processing may be used in order to determine the development of cooking in each particular instance.

The known methods are not suitable for all cooking/baking, in particular for food which is designed to be taken out of the hot cavity at the correct instant. In such 20 cases, it is not a question of programming the oven to switch off but to programme the user to act, either at a given time or when a specific condition of done-ness has been established in the oven. The reaction of a user - or the non-reaction, as the case may be - is an unpredictable parameter, and hence known ovens do not give the impression of functioning properly at all times. Simply put, if the user forgets to take 25 the food out of the oven at the correct time, it will be overcooked. There is hence a need to provide technical means to minimise the consequences of lack of user cooperation. There is a further need to communicate to the user by other means than the activation of a sounder, such as the ringing of a bell.

30 It is the purpose of the invention to provide an oven in which the above disadvantages and limitations have been eliminated in an efficient and economic manner.

This is obtained by letting the advent of the finishing time trigger the release of the oven door so that it opens positively. This measure will bring about either proper cooling, in case the contents have been forgotten by the user, or it will advertise the fact that the cooking has been finished, both visually in large-scale, and olfactory, 5 because the opening which has a much larger cross section than ordinary vents, will provide full exit of steam and fumes.

In an advantageous embodiment the primary opening of the door is only partial. This has the advantage of preserving child safety, preventing access to the escaping steam 10 and fumes. Such a positive partial opening may be followed by a full opening after an optional cooling-off period.

In a further advantageous embodiment the opening of the door is accompanied by a turning on of the oven cavity light. This provides a further indication of the action of 15 the oven door, in that the presence of a cloud of steam will be advertised by light from behind.

In a further advantageous embodiment, the oven door and oven cavity light are linked such that any manual closure or opening of the oven door causes a gradual change in 20 light intensity from full light to dark and from dark to full light respectively, whereas a cooking status triggered door operation causes a sudden light intensity change. The user will perceive the calm and confident handling of the food by the automatic oven when operating it, while being rudely advertised of the finishing time by the instant presence of light and steam and fumes.

25 A further embodiment is particular in that the triggering of the door opening is obtained by means of signals from smoke detecting means. This has the added advantage that an erroneous adjustment of the cooking parameters at the initiation of cooking will not result in charred food, because the door opens and the oven 30 switches off. As a minimum result of this provision, the need for cleaning of the cooking vessels and oven are simplified, and there is an increased chance of re-cooking and obtaining useful cooked food in spite of the original erroneous adjustment.

A further embodiment is particular in that the triggering of the door opening is obtained by means of signals representative of a reduction of the amount of steam developed over time. This feature is food dependent and would represent e.g. cakes
5 and bread.

The fundamental aspect of the invention is the combination of creating a fast normalisation of the cooked food with advertising that it is finished. This is brought about by the means defined in the claims. A further aspect is that of safety, in
10 particular for children, when a kitchen appliance which stores a large amount of thermal energy, suddenly releases it. Hence the provision of a gradual opening of the door in order to prevent children from obtaining direct access to large areas of hot surface. The triggering of the door release is obtained by a signal which represents that cooking has finished, and a number of signals may be used to this end. The door
15 will not only be released, but it will be opened positively, i.e. by means of the release of energy stored in a spring or by means of a motor. The latter is the choice when the door is actually made like the front of a drawer which slides out from the oven.

The invention will be described more fully in the following with reference to the
20 drawings in which

Fig. 1 shows a spring-loaded door with a trigger device and two-stage opening, and
Fig. 2 shows the cavity light intensity as a function of time and closure, respectively
25 opening, of the oven door in the cases that a manual operation is performed or a triggered operation.

In Fig. 1 is shown an oven door which is closed shut against a spring force as a storage device, or a motor creating a suitable resistance. The oven door 1 is closed
30 against the cavity 2 when it is at 0° opening angle. The spring arrangement 3 acts on a lever 5 at the bottom of the door (however, many practical, similar embodiments are possible) in order to open it against the resistance of the dashpot 6. The oven door is indicated in 3 positions: 0°, 15°, and fully open at 90°. The position of the

door is linked to the level of light emitted by a suitably fitted lamp 7. A blower is connected to the space S and may through openings 8 blow a stream of air along the oven door 1 to draw fumes out and to cool the door when it is in the limited opening position at 15°. A humidity sensor 9 is connected to the control electronics 10 which 5 in turn controls the blower and release means for the door C.

As shown in Fig. 2, upon closing the light in the cavity will gradually decrease, which is shown at the middle part of the graph ($t_3 - t_4$). If the oven is to be opened manually, this does not occur by pulling a handle, but by pushing a control button 10 which is suitably linked to a catch C. The actual opening does not occur until the light has increased gradually from zero ($t_1 - t_2$), and then the door opens, driven by a spring force or a motor but at a slow speed commensurate with the perceived speed in increasing the light. This is shown in the left-hand part of the graph. A suitable combination of the two speeds which will be easily determined by the skilled person 15 will create a sense of elegance, of luxuriousness, thereby adding value to the product. Similarly, the closing of the door does not need to be performed manually but may occur through motor drive in conjunction with the changing light level.

In case the door opens because a cooking operation has finished, it has been found 20 expedient to make a decided contrast in the manner in which the light inside the cavity changes, i.e. to let the opening be accompanied by a sudden increase in light. Alternatively, the light may be set to flash at an insistent rate, at least for the time that the oven door is only partly open, and changing for a stable light when the oven door is manually activated in order to remove the cooked food. This is shown in right-hand 25 part of Fig. 2, in which it is seen that for the chosen opening angle of the oven door, *in casu* 15 °, the light flashes insistently until the time t_6 , whereupon it changes to normal combined opening and light change. During the time from t_5 to t_6 a blower fitted into the oven door drive compartment blows cooling air taking from outside the oven cavity over the inside of the door as well as carrying the smell of finished food 30 into the living quarters.

The skilled person will be able to devise any suitable combination of light and opening according to special needs.

P A T E N T C L A I M S

1. A device for terminating cooking and indicating the status in an oven for the preparation of food comprising an oven cavity and an oven door,
5 characterised in that the advent of the finishing time triggers the release of the oven door so that it opens positively.
2. A device according to claim 1,
characterised in that the primary opening of the door is only partial.
3. A device according to claim 1,
10 characterised in that the opening of the door is accompanied by a turning on of the oven cavity light.
4. A device according to claim 1,
characterised in that the oven door and oven cavity light are linked such that any manual closure or opening of the oven door causes a gradual change in light
15 intensity from full light to dark and from dark to full light respectively, whereas a cooking status triggered door operation causes a sudden light intensity change.
5. A device according to claim 1,
characterised in that the triggering of the door opening is obtained by means of signals from smoke detecting means.
- 20 6. A device according to claim 1,
characterised in that the triggering of the door opening is obtained by means of signals representative of a reduction of the amount of steam developed over time.
7. A device according to any of the preceding claims,
25 characterised in that the advent of finishing time releases the door to a limited opening which is less than full opening.
8. A device according to claim 7,
characterised in that a blower blows air taking from outside the oven cavity over the inside of the door in order for it to exit through the limited opening.

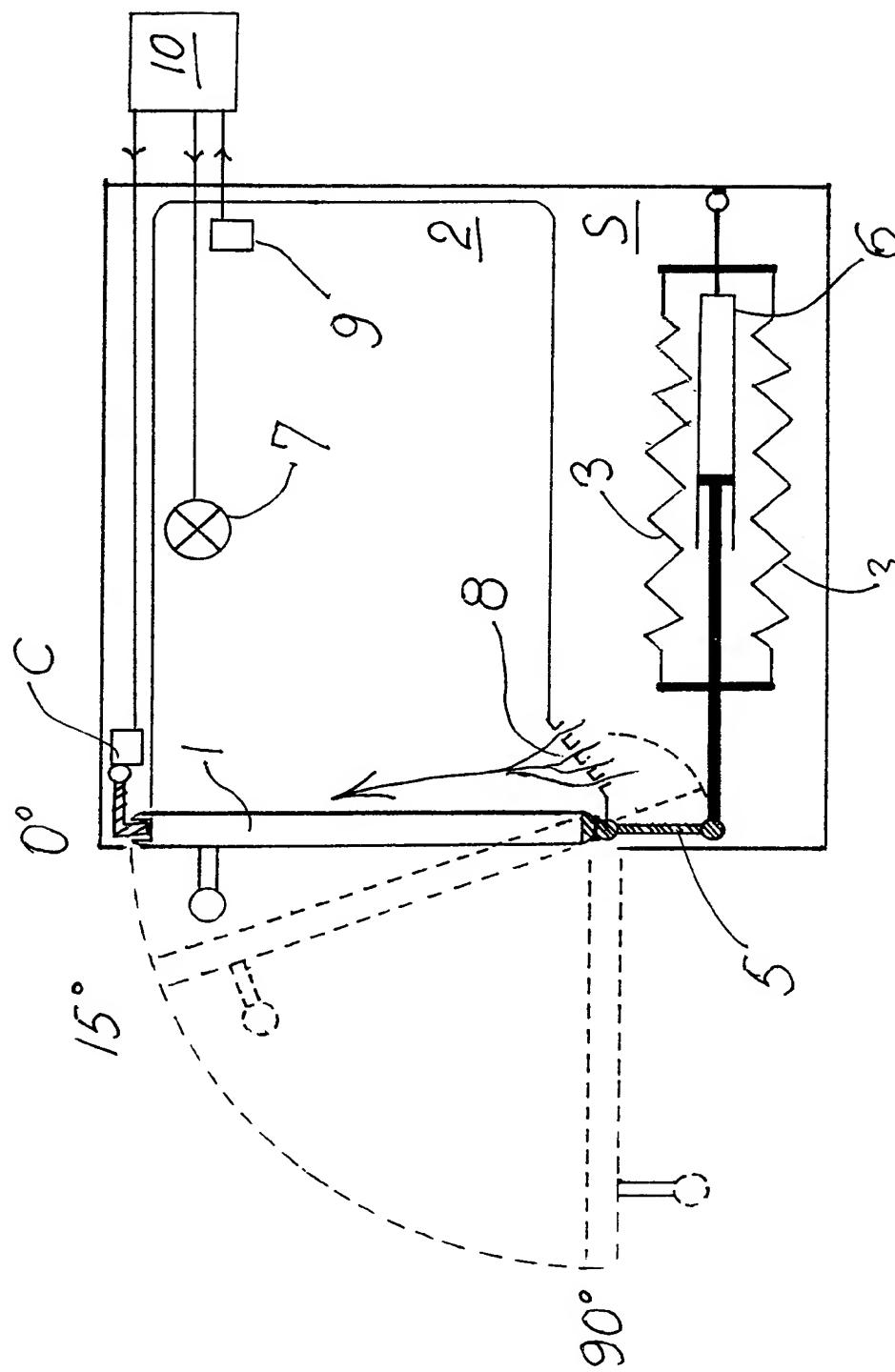
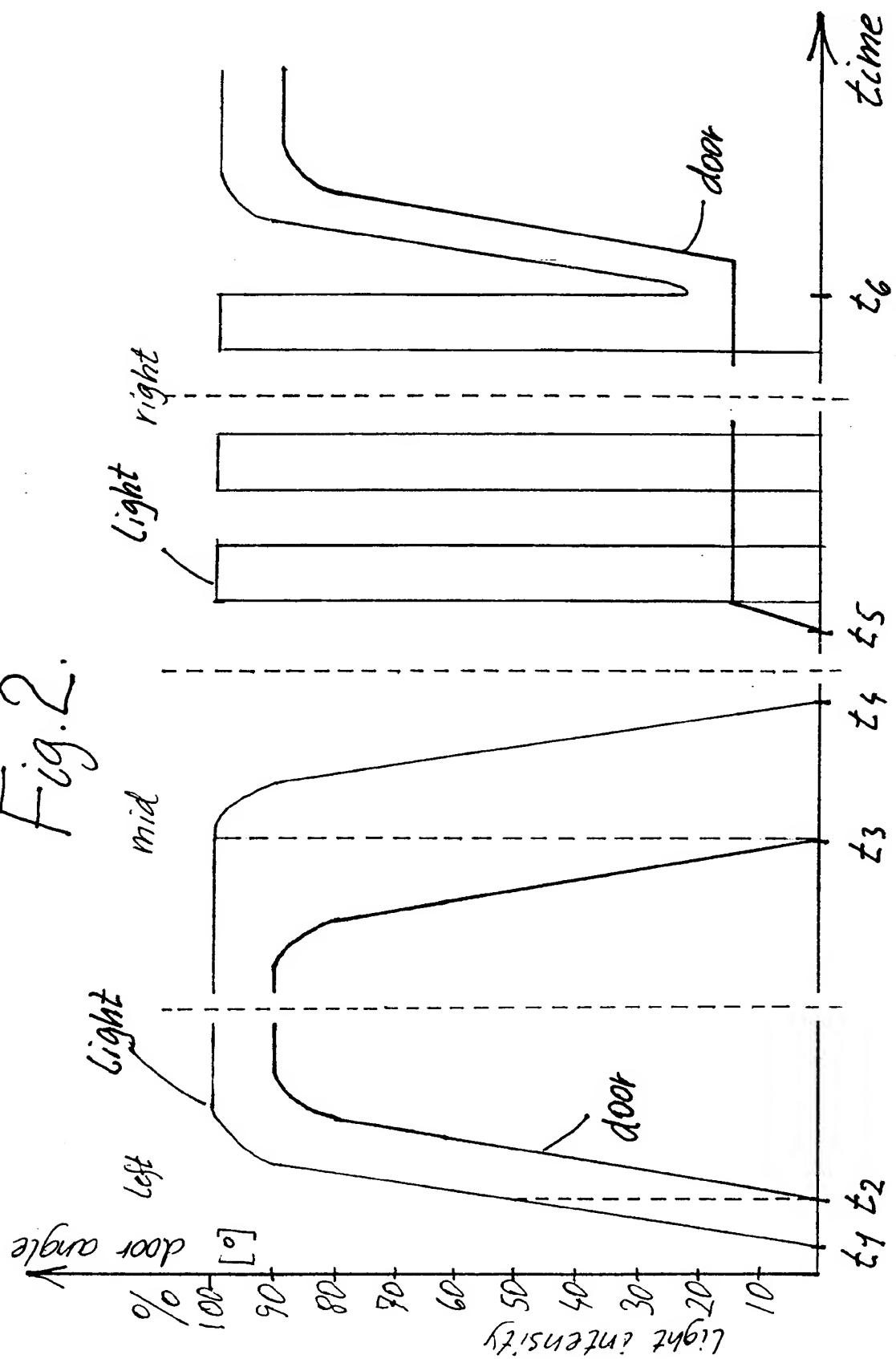


Fig. 1.

Fig. 2.



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INTERNATIONAL SEARCH REPORT

10 International application No.

PCT/DK 00/00093

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F24C 7/08 // F24C 7/02, F24C 15/02, H05B 6/80
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F24C, H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Patent Abstracts of Japan, abstract of JP 9-33051 A (SANYO ELECTRIC CO LTD), 7 February 1997 (07.02.97), see the whole document --	1,2,3,5,6,7
&	JP 9-33051 A (SANYO ELECTRIC CO LTD), 7 February 1997 (07.02.97), figures 1-5 --	1-3,5-7
X	US 5767493 A (WERNER LAUTENSCHLÄGER), 16 June 1998 (16.06.98), column 2, line 5 - line 25, figures 1, 2 --	1,2,3,5,6,7

 Further documents are listed in the continuation of Box C. See patent family annex.

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A	GB 2302188 A (COBOLT SYSTEMS LIMITED), 8 January 1997 (08.01.97), page 1, line 5 - page 2, line 15, abstract -- -----	1-8

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Information on patent family members

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